

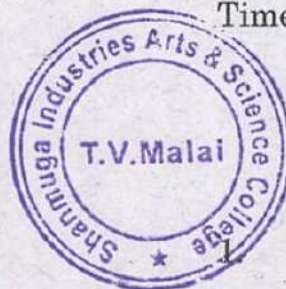
18. Discuss the principle of electron spin resonance spectroscopy and its applications for the study of vanadyl and manganese complexes.
19. Discuss the theory, instrumentation and applications of AFS and AES.
20. Describe the principle, interfaces, advantages and applications of Laser Raman spectroscopy.

APRIL/MAY 2025

**GECH43A/DECH43A — INORGANIC
CHEMISTRY – IV**

Time : Three hours

Maximum : 75 marks



SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

The stretching vibration of chlorine is IR inactive but Raman active. Give the reason.

2. Sketch the various vibrational modes of CO₂ molecules.
3. Predict the ³¹P NMR spectrum of P₄S₃.
4. Define asymmetry parameter in NQR.
5. What is the resonance condition in ESR spectroscopy?
6. State Koopman's theorem.
7. State the principle of HPLC.
8. What is ICP, AAS? What are its advantages?
9. Enlist the merits of Guoy method.
10. State the principle of amperometry.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Explain any two differences and two similarities between IR and Raman Spectroscopy.

Or

- (b) How is Raman spectroscopy applied to metal complexes and what are its uses?

12. (a) What structural information is provided by NQR in the study of group III halides?

Or

- (b) Write down the applications of Mossbauer spectroscopy in the structural determination of (Sn) systems.

13. (a) Deduce the line shape analysis using McConnell's equation in slow and fast exchange processes.

Or

- (b) Discuss the ESR spectrum of bis(salicylaldehyde) copper(II) complex with suitable energy level diagram.

14. (a) Explain the instrumentation and any two applications of AAS?

Or

- (b) Deduce the instrumentation and applications of Inductively coupled plasma spectroscopy.

15. (a) Explain regarding determination of magnetic susceptibility by Faraday method.

Or

- (b) Illustrate the Principle, instrumentation and applications of Polarography.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the usefulness of infra-red and ultraviolet spectra in the structural elucidation of organometallic compounds.

17. How many lines are expected in the Mossbauer spectra of the following complexes?

- (a) FeCl_3
(b) $\text{Fe}(\text{CO})_5$
(c) $\text{Fe}_2(\text{CO})_9$
(d) $\text{Fe}_3(\text{CO})_{12}$. Explain.

